Medycyna Pracy 2018;69(2)
http://medpr.imp.lodz.pl/en

https://doi.org/10.13075/mp.5893.00577

ORIGINAL PAPER

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ECONOMIC COSTS DUE TO WORKERS' SICK LEAVE AT WASTEWATER TREATMENT PLANTS IN BULGARIA

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Abstract

Background: The compensatory mechanisms of social security include expenses for sick leave. The aim of the study is to determine the economic cost due to sick leave among workers in wastewater treatment plants (WWTPs), comparing with the same economic indicators of the National Social Security Institute (NSSI) in Bulgaria. **Material and Methods:** The sick leave of 111 workers at 3 WWTPs was studied in the period 2012–2014 on the grounds of registered absences from work due to temporary incapacity for work. The economic indicators of the NSSI, the gross salary at WWTPs, payable social security contributions and compensatory payments for sick leave have been used for economic cost calculation for temporary incapacity of the workers. **Results:** The frequency of cases and the frequency of lost days due to temporary incapacity were increased in the observed period at WWTPs and in Bulgaria, and it is significantly higher for the employed at WWTPs. The percentage share of workers equivalent to 1.66% at WWTPs have not worked for an entire year as a result of temporary incapacity in 2012, 2.76% – in 2013, and 4.61% – in 2014. The economic burden due to sick leave at WWTPs was raised from EUR 4913.02 in 2012 to EUR 16 895.80 for 2014 for employers and the NSSI. **Conclusions:** The frequency of cases and the frequency of lost days due to temporary incapacity were increased in the observed period at WWTPs and in Bulgaria, and it is significantly higher for the employed at WWTPs. The economic burden was equally distributed between employers and the NSSI. Med Pr 2018;69(2)

Key words: sick leave, wastewater treatment plant, economic losses, cost of illness, economic burden, social security contributions

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Received: November 2, 2016, accepted: October 10, 2017

INTRODUCTION

Social security ought to be considered to be a touchstone of modern society: social security aids in addressing a wide array of socio-economic challenges, thus making any given society more resilient. The extent of social security coverage is influenced by factors such as the level of national economic development, the political stability or lack thereof, the legal scope of the national social security system, the effectiveness of the tax system, and the level of urbanization, among others. In order to achieve the core objectives of a social protection system, health-related challenges must be anticipated, so that the appropriate benefits and services could be provided.

The rise in the importance of noncommunicable diseases for the global health burden is a major public policy challenge: this challenge has recently been addressed at the World Social Security Forum of the International Social Insurance Association (ISSA) in Panama [1]. At least 145 countries worldwide provide paid sick days for short- or long-term illnesses, with more than 79 countries offering sickness benefits for a certain number of weeks (26 or more, depending on the country) or until recovery [2]. The key rationale for paid sick leave is that work should not threaten health and that ill health should not lead to loss of income and work [3]. In this context, the social security administration can support the efforts of employers to adapt workplaces to the needs of ageing workforce and to promote

Funding: this study was supported by Medical University of Plovdiv (project No. HO-06/2014 entitled "Evaluation of the professional health risk from exposure to biological agents among workers in wastewater treatment plants for municipal wastewater," project manager: Tanya Turnovska, M.D., D.M.Sc) and by Medical University of Plovdiv (project No. BG05M2OP001-2.009-0025 entitled "Doctoral Training at Medical University of Plovdiv for Competency, Creativity, Originality, Accomplishment and Academic Excellence in Science and Technologies – 2 (DOCTORANT – 2)," project manager: Victoria Sarafian, M.D., PhD., D.M.Sc.).

improvements in health and well-being. The benefits of paid sick days and the effects of paid sick days' policies have been summarized in a recent study [4]:

1. Employers benefit from paid sick days, as contagion in the workplace is reduced and productivity is improved, while the number of workplace injuries decreases and the turnover lessens.
2. Paid sick days improve public health as they increase the use of preventive care, allowing timely treatment for illnesses, thus improving family health.
3. Paid sick days bring economic benefits for workers, families, and communities due to the improved employment and earnings stability, the enhanced labor force attachment among caregivers, as well as savings from the reduced utilization of hospital emergency departments and the lower monetary burden on taxpayers.

The economic costs, interpreted in monetary terms, may be classified into the following 5 main types: productivity costs, healthcare costs, quality of life losses, costs of administration, and insurance costs [5]. Many authors perceive sick leave as part of the productivity costs burden; they identify 4 main categories of work-related ill-health: accidents and injuries at work, occupational diseases, work-related diseases, and presenteeism. According to some of the same authors, in none of the European countries, there is sufficient data to estimate the exact work-related disease burden or the cost of that burden [6].

Paid sick leave may reduce the risk of occupational injuries, especially in high-risk industries such as construction, manufacturing, agriculture, and health care [7]. International data on expenditure of paid sick leave needs to be interpreted very carefully since differences in social protection schemes are often not accounted for: examples of such dissimilarities may be found in the way paid sick leave is registered by sickness or disability schemes, the employment and working contexts in terms of annual work days, weekly work hours, etc. [8].

According to the European Observatory of Working Life [9], absence from work is an issue that does not receive sufficient attention in Bulgaria. While it is well known that the cost of absence from work includes compensation to the employee, in addition to losses for the employer due to disrupted work organization and non-realized production, it is claimed that there is no reliable and well-classified system of indicators that could allow the causes and extent of the problem to be analyzed. Furthermore, it is suspected that a large number of sick notes (sick leave documents) are issued fraudulently in order to claim social benefits [9]. As a result of these suspicions, there have been some recent changes to the Bulgarian legislation.

The Bulgarian state has always tried to control paid leave expenditure. Sick leave has traditionally been authorized by the appropriate health authorities (the ones responsible for the work capacity assessment of sick workers). The sick note that certifies a worker's temporary incapacity for work must be issued on the first day of the incapacity period, and must specify the type of incapacity, the type of treatment if such is needed, and the duration of the leave [10]. Sick notes are presented by employees to their employer who, in turn, notifies the National Social Security Institute in Bulgaria (NSSI) of the sick leave. The compensation used to be paid by the NSSI.

However, in 2012, an amendment to the Social Security Code [10] changed that: the social insurance contributor must provide compensation for the first 3 work days at the rate of 70% of the average daily gross remuneration for the month in which the incapacity is incurred. This amendment attempts to render employers responsible to a certain degree for the validity of documents issued as proof of temporary-incapacity diseases, especially in the case of short periods of temporary incapacity. The NSSI offers compensation for the rest of the paid leave period in the amount of 80% of the basic income (from the 4th day of sickness until working capacity is recovered or until the disability is deemed permanent). If the temporary incapacity for work is due to an occupational incident or an occupational disease, then the compensation amounts to 90% of the average daily gross remuneration or average daily social security income. Economic costs due to paid sick days are calculated on the grounds of social security contributions and compensations paid. Benefits are paid for the entire period of the sick leave.

When it comes to factors that influence the duration and kind of sick leave, it must be acknowledged that some of them are well analyzed. Such is the case with the impact of sex and age on the level and nature of morbidity rate [11]. Certain risk factors that are not necessarily related to occupational conditions (family history, contact with infectious patients, smoking, alcohol abuse, reduced physical activity, unhealthy diet, etc.) could have a significant impact on the duration of sick leave [12]. The specific conditions of work at wastewater treatment plants (WWTPs) such as shift work, exposure to biological and chemical agents, noise, etc., may

cause or exacerbate the condition which generates the need for sick leave [13–18]. The compensation for temporary incapacity for work is paid for the working days in accordance with the shift (individual or team) schedule of work of the person insured.

The aim of the study is to determine the economic cost due to sick leave among workers at wastewater treatment plants, comparing with the same economic indicators of the National Social Security Institute in Bulgaria.

We expect that lower-income employees, such as the ones working at WWTPs, benefit more often from the compensatory mechanism of the Social Security system in cases of temporary disability.

MATERIAL AND METHODS

The sick leave (registered absences from work due to diseases causing temporary incapacity to work) of 111 workers at 3 wastewater treatment plants (WWTP) was studied in the period between January 1, 2012 and December 31, 2014. All cases of inability to work starting in that period, regardless of the date of their termination, were included in the analysis. The contingent studied represents 20.22% of the employed people in Bulgaria, registered as working in the economic activity Wastewater collection, discharge and treatment during 2014. There were two study inclusion criteria: 1) the individuals working at the WWTP must be exposed to biological agents during the fulfillment of their work duties, and 2) the individuals must have expressed in writing their consent for study participation. There was a pair of exclusion criteria: 1) an employee's refusal to participate in the study or 2) an employee's termination of employment.

The 3 wastewater treatment plants are located in one of the 4 water basin management districts in Bulgaria, the East Aegean Sea Basin District. These plants have the greatest design capacity in terms of unit per capita loading (population equivalent – PE) and are intended to treat household, production and atmospheric wastewater. Technological processes in all 3 WWTPs conform to the standard of a primary (mechanical) treatment, followed by a biological step, which accounts for similar occupational conditions, work organization and occupational environmental factors. Certain differences may be found only at the final stage of sludge processing.

The sources of information were medical documents of employees' temporary inability to work. Data on sick-leave (i.e., the total number of lost working days due to physician-certified sick leave during a calendar year) was obtained from the Human Resources and Management of Property Departments of the Water Supply and Sewerage companies. Besides that, we obtained information about the total number of workers hired, their distribution according to sex (male, female), according to the length of service at the position studied: up to 1 year, 1–5 years, 6–10 years, 11–20 years, and over 20 years; and according to age: younger than 20 years old (19 years, 11 months, 29 days), 20–30 years old, 31–40 years old, 41–50 years old, 51–60 years old, and 60 years old and older.

Workers were divided into 3 groups:

- operators of water treatment facilities (type A workers);
- maintenance staff: fitters, mechanical fitters at wastewater treatment plants, electric operators, electricians (type B workers);
- workers (other than the above enumerated) exposed to biological agents – technologists, sample takers, laboratory technicians, launderers, material distributors, drivers (type C workers).

The study complies with the requirements of the Helsinki Declaration of 2013 on ethical principles in science, the principles of good clinical practice, the Bulgarian legislation on carrying out clinical and scientific research involving people. The study is approved by the Commission on Ethics in Science (Protocol No. 3/06.26.2014) at Medical University of Plovdiv, Bulgaria.

We used the following data for the analysis of paid sick leave for the appropriate calendar year [19]:

- the number of employees with registered sick leave (holders of sick notes for temporary incapacity for work);
- the frequency of workers with temporary incapacity calculated as the ratio of the number of workers with sick leave and the number of all workers (as a percentage);
- primary documents (the absolute number of cases) for temporary incapacity for work;
- the total number of sick leave days;
- the average duration of sick leave instances calculated as the ratio of the total number of sick leave days and the number of sick leave instances;
- the frequency of cases with temporary incapacity to work calculated as the ratio of the absolute number of cases (the number of primary documents of sick leave) and the number of all workers (as a percentage);

- the frequency of days lost due to temporary incapacity to work calculated as the ratio of the number of sick leave days and the number of all workers (as a percentage);
- the number of sick leave instances with duration of up to 3 days (primary documents for temporary incapacity to work);
- the relative percentage share of short-term sick leave calculated as the ratio of the number of sick leave instances with duration of up to 3 days and the number of all cases of sick leave (as a percentage);
- the relative percentage share of employees with a high frequency of sick leave (with 4 or more cases) calculated as the ratio of the number of employees with a high frequency of sick leave and the number of all workers (as a percentage);
- the relative percentage share of long-term sick employees (with more than 30 days of temporary incapacity to work) calculated as the ratio of the number of workers with long-term sick leave and the number of all workers (as a percentage);
- the relative percentage share of employees who are both frequently and long-term sick calculated as the ratio of the number of employees with a long-term sickness and a high frequency of sick leave and the number of all workers (as a percentage). Workers who are both frequently and long-term sick are included in this group only.

We compared the basic parameters to the existing normative groups in Bulgaria [19]:

- the percentage share of temporary incapacity to work with duration of 3 days or shorter is classified as follows: low – up to 40%, average – 40–60%, and high – over 60%;
- the percentage share of both frequently and long-term sick employees is classified as follows: low – to 3%, average – 3–6%, and high – above 6%;
- the frequency of cases with temporary incapacity to work per 100 employees per year is classified as follows: very low – up to 60 cases, low – 60–80 cases, average –80–100 cases, high – 100–120 cases, and very high – over 120 cases, on the scale of Batkis-Lekarev [20];
- the frequency of calendar days with temporary incapacity to work per 100 employees per year is classified as follows: very low – up to 600 cases, low – 600–800 cases, average – 800–1000 cases, high – 1000–1200 cases, and very high – over 1200 cases, on the scale of Batkis-Lekarev [20];
- the average duration of an instance of sickness causing temporary incapacity to work is an outcome indicator that is calculated in accordance with the scale of Batkis-Lekarev (standard – 10 days) [19].

For the economic loss calculation, we relied on data regarding the gross salary at wastewater treatment plants, payable social security contributions, and compensatory payments for temporary incapacity found in the Branch collective employment contract for 2014 for the Water Supply, Sewerage and Wastewater Treatment System, and in the economic indices of the National Social Security Institute in Bulgaria for temporary incapacity to work of the insured workers for the period of 2012–2014 [21].

Economic costs are calculated using the own mathematical model which is our input to methodology of economic losses estimation:

$$\text{Eexp. (TI)} = n \times wd \times (kbtie(year) + kmssc(year)) + m \times wd \times kbtipf(year) \quad (1)$$

where:
Eexp. (TI) – economic expenses due to temporary incapacity,
n – number of absence days due to temporary incapacity at the expense of employers,
m – number of absence days due to temporary incapacity at the expense of public funds [10],
wd – average daily wage,
kbtie(year) – coefficient of benefits for temporary incapacity on the account of the employer,
kmssc(year) – coefficient of monthly social security contributions on the part of the employer,
kbtipf(year) – coefficient of benefits for temporary incapacity on the part of public funds.

Statistics

A value of $p < 0.05$ was accepted as the level of significance in rejecting/accepting the null hypothesis, with a confidence interval of 95%. Differences in results were interpreted as significant ($p < 0.05$), significant at a high reliability level ($p < 0.01$), and significant at a very high level of reliability ($p < 0.001$). Data is expressed as mean±standard deviation (M±SD). The statistical analysis was performed with a Chi^2 test and a Fisher's exact test (2-sided hypothesis) for differences among the 3 groups. The processing, analysis, and tabulated representation of data and results were carried out by means of specialized software and statistical programs such as SPSS v. 17.0 and Microsoft Excel.

RESULTS

Characteristics of the studied employees

All studied workers were engaged under an employment contract. The comparative distribution of employees

in the 3 age groups (Chi^2 = 12.854, degree of freedom (df) = 8, p = 0.117) and the length of service groups (Chi^2 = 7.092, df = 8, p = 0.527) had no statistically significant differences.

The socio-demographic characteristics are presented in the Table 1.

The sex ratio remained constant during the observed 3-year period. The comparative distribution of employees in the 3 groups had statistically significant differences (Chi^2 = 37.572, df = 2, p = 0.0001), with female workers being prevalent in the type C group.

Sick leave analysis

The number of employees with registered sick leave (per registered temporary incapacity to work) and the relative percentage share of employees on sick leave for the period of 2012–2014 are indicated in the Table 2.

Table 2. Workers at wastewater treatment plants (WWTPs), on sick leave, Bulgaria, 2012–2014

Year	Workers [n (%)]			
	operators of water treatment facilities	maintenance staff	others exposed to biological agents	total
2012				
total	49 (49.5)	18 (18.2)	32 (32.3)	99 (100.0)
on sick leave	14 (28.6)	3 (16.7)	13 (40.6)	30 (30.3)
2013				
total	51 (50.0)	18 (17.6)	33 (32.4)	102 (100.0)
on sick leave	18 (35.3)	6 (33.3)	14 (42.4)	38 (37.3)
2014				
total	56 (50.5)	18 (16.2)	37 (33.3)	111 (100.0)
on sick leave	22 (39.3)	3 (16.7)	15 (40.5)	40 (36.0)

Table 1. Socio-demographic characteristics of the workers at wastewater treatment plants (WWTPs), Bulgaria, 2012–2014

Characteristics	Respondents [n (%)] (N = 111)	SE [years]	M±SD (min.–max) [years]
Age			47.47±10.13 (21–72)
20–30 years	6 (5.41)	2.15	
31–40 years	22 (19.82)	3.78	
41–50 years	34 (30.63)	4.38	
51–60 years	40 (36.04)	4.56	
≥ 60 years	9 (8.11)	2.59	
Length of service			11.93±9.10 (0.08–30.25)
≤ 1 year	9 (8.11)	2.59	
1–5 years	20 (18.02)	3.65	
6–10 years	30 (27.03)	4.22	
11–20 years	23 (20.72)	3.85	
≥ 20 years	29 (26.13)	4.17	
Sex			
male	88 (79.28)	3.85	
female	23 (20.72)	3.85	
Staff			
operators of water treatment facilities	56 (50.45)	4.75	
maintenance staff	18 (16.22)	3.50	
others exposed to biological agents	37 (33.33)	4.47	

SE – standard error, M – mean, SD – standard deviation, min – minimal value, max – maximal value.

The data of sick leave of workers at WWTPs is presented in the Table 3.

The relative percentage share of workers with temporary incapacity to work at the WWTPs did not increase during the observed period ($t = 0.884$, $p > 0.05$). No statistically significant difference was found among the numbers of workers on sick leave from the 3 groups (type A, type B, and type C groups): in 2012 ($Chi^2 = 3.269$, df = 2,

Table 3. Sick leave due to temporary incapacity to work of workers at wastewater treatment plants (WWTPs), Bulgaria, 2012–2014

Variable	Year		
	2012	2013	2014
Respondents [n]			
males	78	81	88
females	20	21	23
total	99	102	111
Respondents on registered sick leave [n]			
males	24	31	31
females	6	7	9
total	30	38	40
Frequency of respondents on temporary incapacity [%]			
males	30.38	38.27	35.23
females	30.00	33.33	39.13
total	30.30	37.25	36.04
Primary documents for temporary incapacity at work [n]			
males	67	77	92
females	15	21	20
total	82	98	112
Sick leave (total) [days]			
males	405	598	697
females	61	173	588
total	466	771	1285
Average duration of one case of sick leave [days]			
males	5.5	7.0	6.70
females	4.1	7.5	24.50
total	5.3	7.1	10.04
Frequency of cases with temporary incapacity to work [%]			
males	84.80	95.06	104.55
females	75.00	100.00	86.96
total	82.82	96.07	100.90
Frequency of lost days due to temporary incapacity [%]			
males	512.65	738.27	792.05
females	305.00	823.81	2 556.52
total	470.71	755.88	1 157.66
Cases with temporary incapacity to work with duration up to 3 days (primary documents for temporary incapacity for work) [n]			
males	36	46	55
females	8	6	5
total	44	52	60
Relative share of short-term sick leave [%]			
males	53.73	59.74	59.78
females	53.33	28.57	25.00
total	53.66	53.06	53.57

Table 3. Sick leave due to temporary incapacity to work of workers at wastewater treatment plants (WWTPs), Bulgaria, 2012–2014 – cont.

Variable	Year		
	2012	2013	2014
Relative share of respondents with high frequency of sick leave [%]			
males	7.59	4.94	5.68
females	10.00	0.00	0.00
total	8.08	3.92	4.50
Relative share of long-term diseased respondents [%]			
males	0.00	4.94	1.14
females	0.00	4.76	0.00
total	0.00	4.90	0.90
Relative share of simultaneously frequently- and long-term diseased respondents [%]			
males	5.06	6.17	6.82
females	0.00	9.52	8.70
total	4.04	6.86	7.21

$p = 0.195$), in 2013 ($Chi^2 = 0.580$, $df = 2$, $p = 0.748$), in 2014 ($Chi^2 = 3.512$, $df = 2$, $p = 0.173$). The average duration of a single instance of sickness causing temporary incapacity to work was low in 2012–2013; it reached an average level in 2014 for both sexes combined, with female workers exhibiting a very high level. The frequency of cases with temporary incapacity to work per 100 employees per year was at an average level in 2012, and at a high level both in 2013 and in 2014 according to the scale of Batkis-Lekarev [20].

The frequency of lost calendar days due to temporary incapacity to work per year per 100 employees at WWTPs was at a very low level in 2012, at a low level during 2013, and at a high level in 2014. The relative percentage share of short-term temporary incapacity to work was at an average level during the period under consideration and remained the same during the whole survey period ($p = 0.05$). During the whole period, this percentage share remained at an average level in the male group (according to the existing normative groups), while for the female group, in 2012 it was at an average level, but in 2013 and 2014 it was at a low level.

The relative percentage share of workers at WWTPs with a high frequency of sick leave shows a downward tendency, with no reported cases in the female group in 2013 and 2014. The relative percentage share of both frequently and long-term sick employees was at an average level in 2012, and went up to a high level in 2013–2014. In 2012, 3 male operators had 14 instances of sick leave, totaling 168 days, while 1 man of the type C group had 4 sick leave instances, for a total of 37 days. In 2013, 5 male operators had 32 sick leave instances, totaling 222 days, and 2 women from the type C group had 13 sick leave instances, 88 days in total. In 2014, 5 male operators had 32 instances of sick leave, for a total of 353 days, 1 men had 5 sick leave instances, 53 days in total, and 2 women from the type C group had 12 sick leave instances, totaling 185 days.

According to the nosological structure within the International Classification of Diseases and Related Health Problems (10th revision) [22], the reasons for the high level of lost days among both frequently and long-term sick workers from WWTPs are as follows:

- injury – 10 sick notes for temporary incapacity, 251 days in total;
- endocrine, nutritional and metabolic diseases – 5 sick notes for temporary incapacity, 117 days in total;
- mental and behavioral disorders – 5 sick notes for temporary incapacity, 113 days in total;
- diseases of the nervous systems – 18 sick notes for temporary incapacity, 92 days in total;
- diseases of the musculoskeletal system and connective tissue – 10 sick notes for temporary incapacity, 81 days in total;
- diseases of the circulatory system – 8 sick notes for temporary incapacity, 80 days in total, etc.

There were no registered occupational diseases in any of the observed groups at the WWTPs during the studied 3-year period. In 2014, 1 occupational accident took place with diagnosis of S36 Trauma of abdominal organs in the case of an operator from a wastewater treatment plant: with a total of 6 primary and secondary documents for temporary incapacity to work for 184 sick leave days in total. The frequency of employees suffering from occupational accidents was 0.9%.

In 2014, the coefficient of labor traumatism was 0.9 in the economic activity wastewater collection, discharge and treatment. The average coefficient of labor traumatism for the country in the same period was 0.68.

The data for the same period about workers employed under an employment contract in Bulgaria who had been on sick leave not related to work [21] is presented in the Table 4.

The results show an increasing trend in the relative percentage share of workers employed under an employment contract in Bulgaria, on registered sick leave at a very high level of reliability ($t = 169.25$, $p < 0.001$) for the period of 2012–2014. This percentage share increases at a greater pace at WWPTs (compared to Bulgaria as a whole). The average duration of a single case of sick leave (in days) in Bulgaria does not change during the survey period (in contrast to WWTPs: our results demonstrate that the duration does increase for WWTPs). The frequency of cases with temporary incapacity to work and the frequency of lost days due to temporary incapacity to work in Bulgaria both exhibit an upward trend which is much more significant for WWPTs. In the available literature, there is no data on sick leave instances classified by type of economic activity, duration, relative percentage share of employees with a high frequency of sick leave, of long-term sick employees and of both frequently and long-term sick employees in Bulgaria.

Table 4. Sick leave due to temporary incapacity to work, Bulgaria, 2012–2014

Variable	Year		
	2012	2013	2014
Employed under labor and employment relationship [n]			
males	–	–	–
females	–	–	–
total	2 218 718	2 226 403	2 240 544
Employees on registered sick leave [n]			
males	561 027	634 476	681 153
females	873 131	980 323	1 034 469
total	1 434 158	1 614 799	1 715 622
Primary documents for temporary incapacity to work [n]			
males	448 952	513 077	551 757
females	708 867	807 037	846 916
total	1 157 819	1 320 114	1 398 673
Sick leave (total) [days]			
males	4 889 976	5 581 619	5 900 980
females	7 210 036	8 069 732	8 568 113
total	12 100 012	13 651 351	14 469 093
Average duration of one case of sick leave [days]			
males	8.72	8.79	8.66
females	8.26	8.23	8.28
total	8.43	8.45	8.43
Frequency of cases with temporary incapacity to work [%]			
males	19.0	21.0	23.0
females	30.0	33.0	35.0
total	49.0	54.0	58.0
Frequency of days with temporary incapacity [%]			
males	167.1	186.9	197.0
females	246.4	270.2	286.0
total	413.5	457.1	483.0

"–" – no data.

Economic costs of sick leave

Since 1997 Bulgaria has been in a currency board arrangement, with BGN 1.95583 corresponding to EUR 1.

The basic salary for the studied period is determined in accordance to a branch collective employment contract for Water Supply and Sewerage Companies [23], the minimum salary being calculated on the basis of the minimum salary for the country, adjusted with K = 1.65 (the coefficient for the technicians and applied specialists class). At the time of registration of the sick leave, the minimum salary for the country was as follows: in 2012 – EUR 144.7, in 2013 – EUR 158.5, in 2014 – EUR 173.8.

In 2012, the basic salary for employees at wastewater treatment plants varied from EUR 323.65 for executives, EUR 294.5 for specialists, EUR 264.85 for technicians and applied specialists, to EUR 191.2 for machine operators and fitters. In 2013, the basic salary for employees at wastewater treatment plants varied from EUR 337.45 for executives, EUR 306.8 for specialists, EUR 276.1 for technicians and applied specialists, to EUR 199.4 for machine operators and fitters. In 2014, the basic salary for employees at wastewater treatment plants varied from EUR 359.95 for executives, EUR 327.2 for specialists, EUR 294.5 for technicians and applied specialists, to EUR 212.7 for machine operators and fitters.

According to data of the National Social Security Institute of Bulgaria, the average salary in 2012 was EUR 373.76, in 2013 – EUR 396.25; in 2014 – EUR 420.3 [24].

We have established that the basic salary of technicians and applied specialists at WWTPs was 36% lower than the average salary for the country in 2012, 36% lower – in 2013 and 32% lower – in 2014.

For the studied 1-year period, as a result of sick leave, in 2012 1.84 workers at WWTPs did not work for an entire year, which amounted to 1.66% (with 253 annual work days); 3.06 workers did not work in 2013, which was 2.76% (with 252 annual work days); and 5.12 workers in 2014 – 4.61% (with 251 annual work days).

In accordance with the legislation of the Republic of Bulgaria which was effective during the studied period, the employer and the employee make social security contributions in a 60:40 proportion to the following funds: Pensions Fund, General Disease and Maternity Fund, Unemployment Fund, Health Insurance Fund. The employer is responsible for the whole premium to the Occupational Accident and Occupational Disease Fund [10]. Social security contributions are not made by the employee in the case of sickness resulting in temporary incapacity to work.

The total amount of the monthly social security contributions paid by employers was 17.9% of the gross salary in 2012 and in 2013, and 18.1% – in 2014. The following contributions are included here: Pensions Fund: 9.9%, General Disease and Maternity Fund: 2.1%, Unemployment Fund: 0.6%, Occupational Accident and Occupational Disease Fund: 0.5% (0.7% in 2014, respectively), and Health Insurance Fund: 4.8%. The average monthly amount of social security contributions for one wastewater treatment plant worker at those insurance levels, as well as the economic losses suffered by employers and the National Social Security Institute, due to the worker's sick leave are presented in the Table 5.

Since the 2012 change in Bulgarian legislation concerning partial payment of sick leave compensations (the first 3 days of sick leave instance being covered by employers), the burden of economic losses due to payment of compensations (based on primary documents for temporary incapacity for work) has been equally distributed between employers and the state.

Table 5. Burden upon distribution of economic losses due to temporary incapacity to work of workers at wastewater treatment plants (WWTPs), Bulgaria, 2012–2014

Year	Average salary [EUR]	Monthly social security contributions [EUR]	Benefits for sick leave on the account of the employer (70% of the average salary)		Benefits for sick leave on the account of NSSI (80% of the average salary)		Social security contributions paid by the employer during the worker's absence due to temporary disability		Economic loss (total) [EUR]
			days (months)	EUR	days (months)	EUR	days (months)	EUR	
2012	238.78	42.74	224 (10.6)	1 771.73	242 (11.5)	2 196.75	466 (22.1)	944.54	4 913.02
2013	261.53	46.81	279 (13.3)	2 434.85	492 (23.4)	4 895.84	771 (36.7)	1 718.09	9 048.78
2014	286.84	51.92	279 (13.3)	2 670.47	1 006 (48.1)	11 037.58	1 285 (61.4)	3 187.73	16 895.80

NSSI – National Social Security Institute.

DISCUSSION

In 2010, the European Foundation for the Improvement of Living and Working Conditions compared the mean absence rates from the 27 European Union (EU) Member States and Norway, the costs involved, policies for dealing with absence from the workplace and various developments in relation to promoting health and

well-being. They found that the absenteeism rate varied from 0.8% in Italy to 7.7% in Norway. The headline absence rate in Bulgaria was 7.4% during 2007, but it had declined since 2002 [25]. We found that during the period of 2012–2014 the number of cases tended to increase but was significantly lower than the one in the report.

Our study found an upward tendency in the number of lost days per year due to sick-leave at WWTPs: it increased from 1.66% in 2012 to 4.61% in 2014. Similar results were reported in other countries. In Germany, 4% of contracted labor is lost every year due to sickness absence. German employees take an average of 16.5 days of sick leave per year, while the average number of days of sick leave varies dramatically among OECD (Organisation for Economic Co-operation and Development) countries between 4.1 days (United States) and 29.2 days (Slovakia) [26]. We found that in the period 2012–2014 the average duration of 1 case of sick leave tended to increase from 5.3 days to 10.04 days for the workers at WWTPs, while this indicator remained at the same level for workers in Bulgaria in general.

Many scientific publications offer data on the correlation between sick leave and age: as age increases, so does the frequency of sickness and chronic diseases. Furthermore, there is evidence that women get sick more than men [11,27,28]. This is also confirmed by the female workers at WWTPs, who have been investigated by us: we have observed a significant increase in the average duration of sick leave. The frequency of cases of temporary incapacity to work increased during the observed period both at WWTPs and in Bulgaria in general, this frequency being significantly higher for WWTPs workers. These results have justified our expectations.

The established profile of diseases in the contingent of the WWTPs may be influenced by risk factors such as family history, contact with infectious patients, smoking, alcohol abuse, reduced physical activity, unhealthy diet, etc., none of which is directly related to occupational conditions. Still, work conditions influence significantly frequently and long-term sick employees. In the future, we plan to provide a detailed study of these issues.

It is proven that there is a strong correlation between the duration of sick leave and the seriousness of the illness. It is also dependent on the presence or absence of traumas or chronic diseases because they require a prolonged period of absence from work due to treatment and rehabilitation. This study confirms the above statements [29].

According to the WHO (World Health Organization) report (2014) [30], the total expenditure on health as percentage of gross domestic product in Bulgaria increased from 6.2 in 2000 to 7.3 in 2011 (in the upper middle income group); social security expenditure on health as percentage of general government expenditure on health increased from 12 in 2000 to 68.4 in 2011 (in the high income group); per capita government expenditure on health (Purchasing Power Parity in international dollars) increased from 235 in 2000 to 597 in 2011 (in the upper middle income group). Compared with the same data for the European Region, the total expenditure on health as percentage of gross domestic product increased from 7.9 in 2000 to 9 in 2011; social security expenditure on health as percentage of general government expenditure on health decreased slightly from 52.5 in 2000 to 51.3 in 2011 [30].

Implementing a successful "whole of governance" approach to health while achieving a reduction in economic losses is difficult and challenging. Despite the current economic difficulties that the European Region faces, European governments must retain the ultimate responsibility for and commitment to protecting and promoting the health and well-being of the society [31]. Enabling people to take control over their health and its determinants strengthens communities and improves lives. Many aspects of social health protection (including the role, patterns, and costs of paid sick leave) may be misunderstood or underappreciated especially during times of economic crisis and recession.

Economic incentives, as set by policy makers, shape the decisions of employees to go on sick leave. Paid sick leave schemes are often considered to be open to abuse, especially if the benefit is attractive. This is undoubtedly a danger, and points to the need for strong administration [3]. It is necessary to elaborate a complex person-oriented strategy to reduce the level of diseases with temporary incapacity, both in terms of frequency and severity. This strategy should include measures to ensure the prevention and monitoring of chronic and long-term diseases, their adequate treatment, the inclusion of workers in health promotion programs, as well as measures to guarantee a good collaboration between general practitioners (GPs) and physicians from the occupational health services, and to reduce the levels of existing job hazards and management of the residual risks to the health and safety of workers [32].

The study demonstrated that the administrative measures taken by the NSSI and employers to limit the economic costs due to temporary incapacity for work

were not effective. For instance, the recent change in legislation (2012) [10] that transferred some of the economic burden onto employers (who are responsible for the compensation for the first 3 days of a paid sick instance) did not achieve the projected drop in the number of sick leave instances: in 2012–2014 the total number of sick leave instances actually increased. The ineffectiveness of the measures that were taken may be explained by a poor ability to identify and quickly rectify shortcomings such as organizational, financial and legislative inadequacies. It has been observed by some authors that employees adapt their sick leave behavior to changes in legislation sick leave benefits. Thus the increase in sick leave among workers at WWTPs may be explained by certain changes in legislation: in 2014, the NSSI speeded up the payment of benefits. When their income is not interrupted by unpaid leave, families experience greater financial stability and economic well-being. Another factor is the rise in wages. In support of this, there are studies that show that low-income workers are the ones who can least afford to lose pay when they are sick [33].

A number of authors argue that an increase in the number of sick leave days will lead to lost productivity. Lost productivity due to illness should be appropriately measured and valued. There are several difficulties with the calculation of the economic costs resulting from paid monetary compensations for temporary incapacity to work. Existing instruments generate varied estimates of productivity loss [34]. The greatest difficulty is the lack of unified and recognized methods for arriving at such estimates [35–37].

The complexity and divergence of payment systems in various countries means that the problem related to determining a common, comparable basis is still not resolved. The direct costs may be deduced from reliable data sources. But besides direct expenses, there are also indirect costs to employers and the state. Calculating indirect costs may be very challenging. Tompa et al. [38,39] defined a number of challenges that put a barrier to undertaking sound economic evaluations of the Occupational Safety and Health (OSH) interventions: the burden/benefit of costs and consequences which may be borne by varioust stakeholders in the system; the presence of multiple providers of insurance for the coverage of losses, because of which no single insurer accurately captures the full costs associated with injuries and illnesses or the benefits of their prevention; existing human resource practices such as hiring contract of temporary worker services, which can make it difficult to account for all workers and their exposures.

Despite some limitations such as the comparatively small number of studied workers, the fact that our calculations were made on the basis of the average salary in the studied companies, and the difficulty of comparing different countries' payment systems and of comparing the available data for Bulgaria as a whole and for the WWTPs in particular (there is no distinction made between employed and self-employed insured workers in published statistical data regarding the sick leave status by year from the National Center of Public Health and Analyses, the National Social Security Institute, and the National Statistical Institute), this study is the first one in Bulgaria to investigate the economic costs for employers and the NSSI as a result of sick leave due to temporary disability of workers at WWTPs.

The study offers a mathematical model for calculating the economic loss due to sick leave. The comparison of indicators for diseases leading to temporary incapacity to work at the three WWTPs to those for Bulgaria as a whole was difficult due to the fact that there was no unified statistical system to track the temporary incapacity for work of employees by economic fields. We also based our conclusions on the results from a short three-year period of research which was very dependent on staff-turnover. When calculating the economic losses, we did not take into account some indicators that were specific to each employee such as additional remunerations depending on the wastewater treatment plant capacity (in terms of PE), shift work, additional benefits paid by private insurance companies for the so-called "labor accident" risk, presenteeism, etc.

CONCLUSIONS

It has been established that the number of workers with temporary incapacity to work at WWTPs remained at the same level during the study period. Both the frequency of cases and the number of lost days due to temporary incapacity increased in the observed period at WWTPs and in Bulgaria, the frequency and number being significantly higher for workers at WWTPs. The economic costs of sickness benefits for WWTPs employee rose. It was found that the administrative measures taken by the NSSI (such as the shift in economic responsibility for the first 3 days of sick leave instance from the state to employers) and employers to limit the economic costs of temporary incapacity for work were not effective. It is necessary to design a complex person-oriented strategy to reduce the level of sick leave

by working at its major cause, sickness: it is sickness that must be tackled so that there is an amelioration both in terms of its frequency and severity.

ACKNOWLEDGEMENTS

The authors would like to thank the administration of the 3 Water Supply and Sewerage Companies, the teams of the Occupational Health services, all workers who took part in the study, and the management of the Medical University of Plovdiv for the financial support under the scientific projects No. HO-06/2014 and No. BG05M2OP001-2.009-0025.

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Publisher / Wydawca: Nofer Institute of Occupational Medicine, Łódź, Poland